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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/749,916	12/29/2000	Jerome S. Hubacek	015290-457	6834

7590 12/17/2002

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EXAMINER	
ALEJANDRO MULERO, LUZ L	
ART UNIT	**PAPER NUMBER**
1763	

DATE MAILED: 12/17/2002 17

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/749,916	Applicant(s) HUBACEK ET AL.
	Examiner Luz L. Alejandro	Art Unit 1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 25 November 2002.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1,3-10,21,23,25 and 27-30 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1, 3-10, 21, 23, 25, 27-30 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 3-10, 21, 23, 25 and 27-29 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification, as originally filed, fails to provide support for a silicon electrode having a thickness of about 0.3 inches to 0.5 inches.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 4-10, 21, 23, 25, 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Degner et al., U.S. Patent 5,074,456 in view of Murai, JP 2-20018.

Degner et al. shows the invention substantially as claimed including a single crystal silicon showerhead electrode 12 adapted to be mounted in a parallel plate plasma reaction chamber 50 (see figs. 3-4 and table 1) used in substrate processing, the electrode having an RF driven surface on one side thereof (see figs. 3-4) which is exposed to plasma.

Degner et al. does not expressly disclose that the electrode is a single crystal silicon electrode having an electrical resistivity of less than 0.05 ohm-cm. Murai discloses a low resistivity electrode 2 adapted to be mounted in a parallel plate plasma reaction chamber 5 (see fig. 1) used in substrate processing, the electrode comprising: a single crystal silicon electrode having an electrical resistivity of less than 0.05 ohm-cm (see page 86, first column, lines 22-26), the electrode having an RF driven surface on one side thereof (see abstract) which is exposed to plasma. Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Degner et al. as to comprise an electrode having an electrical resistivity of less than 0.05 ohm-cm because such electrode structure is known to be suitable to be used in a plasma apparatus.

With respect to the electrode having a thickness of about 0.3 to 0.5 inches, Degner et al. shows that the electrode can have a thickness in the range from about 0.1 cm to 2 cm (see figures 1-4 and their descriptions, specifically col. 1, lines 42-48, col. 2, lines 2-7, and col. 4, lines 21-34).

Concerning the electrode having heavy metal contamination of less than 10 ppm, Degner et al., in col. 3, lines 52-64, discloses that in order to achieve high purity in an electrode the metal contamination should be less than 10 ppm.

Regarding the claimed bonding and clamping structures for securing the electrode to a support member, Degner et al. further discloses that the upper electrode can be secured to a support member by either a bonding member comprising a joint having an electrically conductive material between the electrode and the support member and which includes an electrically conductive filler (see col. 5, lines 3-17, col. 5-line 64 to col. 6-line 53) or by a clamping member (see col. 8, lines 10-18).

Furthermore, with respect to the showerhead electrode securing structure of claim 10, Degner et al. further discloses a showerhead electrode which is secured to a temperature controlled member in an interior of the plasma reaction chamber, the temperature controlled member including a gas passage for supplying a process gas to the showerhead electrode, a cavity and at least one baffle plate located in the cavity, the gas passage supplying process gas so as to pass through the baffle prior to passing through the showerhead electrode (see col. 7-line 54 to col. 8-line 39, and the figures).

Regarding claim 25, Degner et al. discloses a backing plate which can be made of aluminum, graphite, stainless steel, copper or other materials (see col. 5-lines 15-17).

With respect to the outlets of the electrodes comprising ultrasonically drilled holes (claim 27), this represents a process limitation which is not given patentable weight in a claim directed to a product.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Degner et al., U.S. Patent 5,074,456 in view of Murai, JP 2-20018 as applied to claims 1, 4-10, 21, 23, 25, 27-30, above, and further in view of Saito et al., U.S. Patent 5,993,597.

Degner et al. and Murai are applied as above but do not expressly disclose the claimed diameter of the gas outlets. Saito et al. shows a parallel plate plasma apparatus having an electrode comprising a plurality of bores having diameters of 0.5 mm, 0.020 inch, (see col. 3, lines 15-17, 56-57, and 65-66; col. 5, lines 1-3; and col. 6, lines 14-15). In view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the electrode's gas outlets of the apparatus of Degner et al. modified by Murai of the claimed diameter because such a dimension is suitable for gas outlets of a showerhead electrode.

Claims 1, 4-10, 21, 23, 25, 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murai, JP 2-20018 in view of Degner et al., U.S. Patent 5,074,456.

Murai shows the invention substantially as claimed including a low resistivity electrode 2 adapted to be mounted in a parallel plate plasma reaction chamber 5 (see fig. 1) used in substrate processing, the electrode comprising: a single crystal silicon electrode having an electrical resistivity of less than 0.05 ohm-cm (see page 86, first

column, lines 22-26), the electrode having an RF driven surface on one side thereof (see abstract) which is exposed to plasma.

Murai fails to expressly disclose the electrode having a thickness of about 0.3 to 0.5 inches, and the silicon electrode being a showerhead. Degner et al. shows a parallel plate electrode apparatus in which the upper electrode is used as a showerhead and which can have a thickness in the range from about 0.1 cm to 2 cm (see figures 1-4 and their descriptions, specifically col. 1, lines 42-48, col. 2, lines 2-7, and col. 4, lines 21-34). Therefore, in view of these disclosures it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Murai as to comprise a showerhead electrode having the claimed thickness because in such a way a uniform plasma is generated since the gases flow downward, the thickness can be optimized based upon a variety of factors such as the cost of the material, and overlapping ranges between the claims and the reference establish a case of prima facie obviousness see MPEP 2144.05.

Furthermore, Murai does not expressly disclose that the electrode has heavy metal contamination of less than 10 ppm. Degner et al. (col. 3, lines 52-64) disclose that in order to achieve high purity in an electrode the metal contamination should be less than 10 ppm. Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of the Murai reference as to comprise an electrode having a metal contamination of less than 10 ppm because this will lead to an electrode having high purity.

Also, Murai does not expressly disclose the claimed bonding and clamping structures for securing the electrode to a support member. Degner et al. further discloses that the upper electrode can be secured to a support member by either a bonding member comprising a joint having an electrically conductive material between the electrode and the support member and which includes an electrically conductive filler (see col. 5, lines 3-17, col. 5-line 64 to col. 6-line 53) or by a clamping member (see col. 8, lines 10-18). In view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus disclosed by Murai as to: 1) bond the electrode to the support member as claimed because, for example, the likelihood of breakage of the electrode or debonding from the support member is reduced as is the distortion, and the thermal contact is improved or alternatively 2) as to use a clamping member because such structures are suitable and known for mechanically securing the electrode to the support member.

Furthermore, Murai fails to expressly disclose the showerhead electrode securing structure of claim 10. Degner et al. further discloses a showerhead electrode which is secured to a temperature controlled member in an interior of the plasma reaction chamber, the temperature controlled member including a gas passage for supplying a process gas to the showerhead electrode, a cavity and at least one baffle plate located in the cavity, the gas passage supplying process gas so as to pass through the baffle prior to passing through the showerhead electrode (see col. 7-line 54 to col. 8-line 39, and the figures). In view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the showerhead

electrode of the apparatus disclosed by Murai as to be bonded to a temperature controlled member as claimed because in such a way uniform distribution of the processing gases is achieved and the temperature of the electrode can be better controlled.

Regarding claim 25, Murai fail to expressly disclose the backing plate being made of aluminum, aluminum alloy, silicon carbide, or graphite. Degner et al. discloses a backing plate which can be made of aluminum, graphite, stainless steel, copper or other materials (see col. 5-lines 15-17). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the electrode of Murai to include a backing plate constructed of, for example, aluminum or graphite, because this will allow for the backing plate to be readily machinable.

With respect to the outlets of the electrodes comprising ultrasonically drilled holes (claim 27), this represents a process limitation which is not given patentable weight in a claim directed to a product.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Murai, JP 2-20018 in view of Degner et al., U.S. Patent 5,074,456 as applied to claims 1, 4-10, 21, 23, 25, 27-30, above, and further in view of Saito et al., U.S. Patent 5,993,597.

Murai and Degner et al. are applied as above but do not expressly disclose the claimed diameter of the gas outlets. Saito et al. shows a parallel plate plasma apparatus having an electrode comprising a plurality of bores having diameters of 0.5 mm, 0.020 inch, (see col. 3, lines 15-17, 56-57, and 65-66; col. 5, lines 1-3; and col. 6,

lines 14-15). In view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the electrode's gas outlets of the apparatus of Murai modified by Degner et al. of the claimed diameter because such a dimension is suitable for gas outlets of a showerhead electrode.

Claims 1, 3-10, 21, 23, 25, and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saito et al., U.S. Patent 5,993,59 in view of Degner et al., U.S. Patent 5,074,456.

Saito et al. shows the invention substantially as claimed including a low resistivity electrode adapted to be mounted in a parallel plate plasma reaction chamber used in semiconductor substrate processing (see col. 1, lines 6-8), the electrode comprising: a single crystal silicon electrode having an electrical resistivity of 0.0001 ohm-cm (see abstract; col. 1, lines 64-65; col. 3, lines 65-67; examples 6-11 of Table 1; col. 4-line 65 to col. 5-line 5; col. 6, lines 10-15; and examples 4 and 7 of Table 2). Since the electrode is used in a parallel plate reactor, it is inherent that the electrode has a surface which is grounded or is coupled to RF power, the surface being exposed to plasma. Furthermore, the electrode comprises a plurality of bores having diameters of 0.5 mm, 0.020 inch, (see col. 3, lines 15-17, 56-57, and 65-66; col. 5, lines 1-3; and col. 6, lines 14-15). It is inherent, in view of this disclosure, that the electrode is being used as a showerhead electrode.

Saito et al. fails to expressly disclose the electrode having a thickness of about 0.3 to 0.5 inches, and the silicon electrode being a showerhead. Degner et al. shows a

parallel plate electrode apparatus in which the upper electrode is used as a showerhead and which can have a thickness in the range from about 0.1 cm to 2 cm (see figures 1-4 and their descriptions, specifically col. 1, lines 42-48, col. 2, lines 2-7, and col. 4, lines 21-34). Therefore, in view of these disclosures it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Saito et al. as to comprise a showerhead electrode having the claimed thickness because in such a way a uniform plasma is generated since the gases flow downward, the thickness can be optimized based upon a variety of factors such as the cost of the material, and overlapping ranges between the claims and the reference establish a case of prima facie obviousness see MPEP 2144.05.

With respect to claim 4, Saito et al. does not expressly disclose that the electrode has heavy metal contamination of less than 10 ppm. Degner et al. (col. 3, lines 52-64) disclose that in order to achieve high purity in an electrode the metal contamination should be less than 10 ppm. Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of the Saito et al. reference as to comprise an electrode having a metal contamination of less than 10 ppm because this will lead to an electrode having high purity.

Saito et al. is applied as above but lacks anticipation of disclosing the claimed bonding and clamping structures for securing the electrode to a support member. Degner et al. discloses a parallel plate plasma reactor in which the upper electrode can be secured to a support member by either a bonding member comprising a joint having

an electrically conductive material between the electrode and the support member and which includes an electrically conductive filler (see col. 5, lines 3-17, col. 5-line 64 to col. 6-line 53) or by a clamping member (see col. 8, lines 10-18). In view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus disclosed by either Saito et al. as to: 1) bond the electrode to the support member as claimed because, for example, the likelihood of breakage of the electrode or debonding from the support member is reduced as is the distortion, and the thermal contact is improved, or alternatively 2) as to use a clamping member because such structures are suitable and known for mechanically securing the electrode to the support member.

Also, Saito et al. fails to expressly disclose the showerhead electrode securing structure of claim 10 and a backing plate elastomer bonded to the electrode as claimed in claim 22. Degner et al. discloses a parallel plate plasma reactor in which a showerhead electrode is secured to a temperature controlled member in an interior of the plasma reaction chamber, the temperature controlled member including a gas passage for supplying a process gas to the showerhead electrode, a cavity and at least one baffle plate located in the cavity, the gas passage supplying process gas so as to pass through the baffle prior to passing through the showerhead electrode (see col. 7-line 54 to col. 8-line 39, and the figures of Degner et al.). In view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the showerhead electrode of the apparatus disclosed by Saito et al. as to be bonded to a temperature controlled member as claimed because in such a way

uniform distribution of the processing gases is achieved and the temperature of the electrode can be better controlled.

Furthermore, Saito et al. fails to expressly disclose the backing plate being made of aluminum, aluminum alloy, silicon carbide, or graphite. Degner et al. discloses a backing plate which can be made of aluminum, graphite, stainless steel, copper or other materials (see col. 5-lines 15-17). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the electrode of Saito et al. to include a backing plate constructed of, for example, aluminum or graphite, because this will allow for the backing plate to be readily machinable.

With respect to the outlets of the electrodes comprising ultrasonically drilled holes (claim 27), this represents a process limitation which is not given patentable weight in a claim directed to a product.

Claims 1, 3-10, 21, 23, 25, 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Degner et al., U.S. Patent 5,074,456 in view of Saito et al., U.S. Patent 5,993,597.

Degner et al. shows the invention substantially as claimed including a single crystal silicon showerhead electrode 12 adapted to be mounted in a parallel plate plasma reaction chamber 50 (see figs. 3-4 and table 1) used in substrate processing, the electrode having an RF driven surface on one side thereof (see figs. 3-4) which is exposed to plasma.

Degner et al. does not expressly disclose that the electrode is a single crystal silicon electrode having an electrical resistivity of less than 0.05 ohm-cm. Saito et al. discloses a low resistivity electrode adapted to be mounted in a parallel plate plasma reaction chamber used in semiconductor substrate processing (see col. 1, lines 6-8), the electrode comprising: a single crystal silicon electrode having an electrical resistivity of 0.0001 ohm-cm (see abstract; col. 1, lines 64-65; col. 3, lines 65-67; examples 6-11 of Table 1; col. 4-line 65 to col. 5-line 5; col. 6, lines 10-15; and examples 4 and 7 of Table 2). Since the electrode is used in a parallel plate reactor, it is inherent that the electrode has a surface which is grounded or is coupled to RF power, the surface being exposed to plasma. Furthermore, the electrode comprises a plurality of bores having diameters of 0.5 mm, 0.020 inch, (see col. 3, lines 15-17, 56-57, and 65-66; col. 5, lines 1-3; and col. 6, lines 14-15). It is inherent, in view of this disclosure, that the electrode is being used as a showerhead electrode. Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Degner et al. as to comprise an electrode having an electrical resistivity of less than 0.05 ohm-cm and a plurality of bores having diameters of 0.5 mm, 0.020 inch, because such electrode structure is known to be suitable to be used in a plasma apparatus.

With respect to the electrode having a thickness of about 0.3 to 0.5 inches, Degner et al. shows that the electrode can have a thickness in the range from about 0.1 cm to 2 cm (see figures 1-4 and their descriptions, specifically col. 1, lines 42-48, col. 2, lines 2-7, and col. 4, lines 21-34).

Concerning the electrode having heavy metal contamination of less than 10 ppm, Degner et al., in col. 3, lines 52-64, discloses that in order to achieve high purity in an electrode the metal contamination should be less than 10 ppm.

Regarding the claimed bonding and clamping structures for securing the electrode to a support member, Degner et al. further discloses that the upper electrode can be secured to a support member by either a bonding member comprising a joint having an electrically conductive material between the electrode and the support member and which includes an electrically conductive filler (see col. 5, lines 3-17, col. 5-line 64 to col. 6-line 53) or by a clamping member (see col. 8, lines 10-18).

Furthermore, with respect to the showerhead electrode securing structure of claim 10, Degner et al. further discloses a showerhead electrode which is secured to a temperature controlled member in an interior of the plasma reaction chamber, the temperature controlled member including a gas passage for supplying a process gas to the showerhead electrode, a cavity and at least one baffle plate located in the cavity, the gas passage supplying process gas so as to pass through the baffle prior to passing through the showerhead electrode (see col. 7-line 54 to col. 8-line 39, and the figures).

Regarding claim 25, Degner et al. discloses a backing plate which can be made of aluminum, graphite, stainless steel, copper or other materials (see col. 5-lines 15-17).

With respect to the outlets of the electrodes comprising ultrasonically drilled holes (claim 27), this represents a process limitation which is not given patentable weight in a claim directed to a product.

Response to Arguments

Applicant's arguments with respect to claims 1, 3-10, 21, 23, 25 and 27-30 have been considered but are moot in view of the new ground(s) of rejection.

Additionally, with respect to amending claim 1 to include the electrode having a thickness of about 0.3 inches to 0.5 inches, such limitation raises the issue of new matter because support only exists in the specification for as low as 0.375 inches, and it is not appropriate to round off 0.375 inches to 0.3 inches in the claim. While the application states making the electrode thicker than a conventional electrode it only states making the electrode with an increase thickness of 0.375-0.5 inches. No support is provided for a thickness between 0.25-0.375 or greater than 0.5 inches. Since it is clear that the range of 0.375-0.5 inches is greater than a conventional 0.25 inches electrode, then, the examiner contends that if it was desired to claim any other range besides 0.375-0.5 inches then it would have been stated in the specification. Furthermore, as evidence by Degner et al., U.S. Patent 5,074,456, conventional electrode thicknesses usually range from 0.039 to 0.787 inches, which clearly includes the recited conventional and claimed electrode thickness ranges.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 703-305-4545. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on 703-308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Luz L. Alejandro
Patent Examiner
Art Unit 1763

December 14, 2002